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EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 06/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/777,800

Applicant(s)

BECKER ET AL.

Examiner

Rodney G. McDonald

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-43 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

Claims 1-43 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 27, 28, 29, 30, 37, 42, 43 are indefinite because it is unclear if the phrase "in particular of a binary photo mask blank, a phase shifting photo mask blank or an extreme ultra violet photo mask blank" is meant to further limit the claims.

Claim 27 is indefinite because it is unclear if the word "(growing)" is meant to limit the claim.

Claim 34 is indefinite because it is unclear if the phrase "(or absorber)" is meant to limit the claims.

Claim 36 is indefinite because it is unclear if the phrase "(by a lithography method)" is meant to limit the claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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Claims 1-9, 11-13, 18-20, 24, 25, 27-31, 34-38 and 40-43 are rejected under 35 U.S.C. 102(e) as being anticipated by Carcia et al. (U.S. Pat. 6,756,161).

Regarding claims 1, 27, 28, 29, 42, 43, Carcia et al. teach a method and apparatus for fabricating a binary photomask blank for selected wavelengths of < 400 nm. (See Abstract) Carcia et al. teach in Fig. 1 providing a substrate 4 and a target 2 in a vacuum chamber where the process pressure is kept from 10^{-3} - 10^{-5} Torr. A first particle beam is provided from a deposition gun 1. Ions from gun 1 sputter the target to deposit a film on the substrate 4. A Cr film can be deposited for example. (Column 4 lines 13-49)

Regarding claim 2, Carcia et al. teach that the first particle beam sputters the target 4 such that particles emerge in a direction of the substrate to deposit on the substrate. (Column 4 lines 13-49)

Regarding claim 3, Carcia et al. teach utilizing the apparatus to produce a multilayer stack of CrO/CrN. (Column 5 lines 24-33)

Regarding claim 4, Carcia et al. teach in Fig. 1 a target with a normal line and the first particle beam hitting the target under an angle to the target normal line. (See Fig. 1)

Regarding claim 5, Carcia et al. teach in Fig. 1 a substrate normal line and sputtered particles (i.e. Si) from the target hit the photomask blank under an angle to the substrate normal line. (See Fig. 1)

Regarding claim 6, Carcia et al. teach that the deposition rate can be greater than 0.1 nm/min. (Column 4 lines 45-47)

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Regarding claim 7, Carcia et al. teach that the photomask blank is irradiated by a second ion beam from an assist gun 6. (Column 4 lines 13-49)

Regarding claim 8, Carcia et al. teach in Fig. 1 a substrate normal line and the second particle beam hitting the photomask blank at an angle to the substrate normal line. (See Fig. 1)

Regarding claim 9, Carcia et al. teach that both guns 1 and guns 6 can be ion guns. (Column 4 lines 13-49)

Regarding claim 11, Carcia et al. teach that the ion guns 1 and 6 are both separately controlled to have different levels of energy with the assist ion beam gun producing ions with a lower energy than that of the deposition ion gun 1. (Column 4 lines 53-59)

Regarding claims 12, 27, Carcia et al. teach that the deposition ion gun can utilize inert gas and that the assist ion gun can utilize reactive gases. (Column 4 lines 13-42)

Regarding claim 13, Carcia et al. teach that the particles of the two ion guns will have different energies. (Column 4 lines 53-59)

Regarding claims 18, 27, Carcia et al. teach that one of the layers can be doped with the second particle beam utilizing reactive gas. (Column 5 lines 24-33; Example)

Regarding claims 19, 27, Carcia et al. teach that multilayers can be deposited with differently doped layers. (Column 5 lines 24-33)

Regarding claim 20, Carcia et al. teach that optical density can be controlled by doping. (Column 6 lines 1-20)

Regarding claim 24, Carcia et al. teach the first particle beam to be an ion beam.
(Column 4 lines 18-28)

Regarding claim 25, Carcia et al. teach the ion beam can be Xe. (Column 4 lines 18-28)

Regarding claim 30, Carcia et al. teach a binary photomask blank with a substrate having single or multilayer depositing on a substrate by ion beam deposition.
(See Abstract)

Regarding claim 31, Carcia et al. teach that the mask blank is treated with a second particle beam. (Column 4 lines 32-42)

Regarding claim 34, Carcia et al. teach that the mask blank can have a CrN layer as the light-reducing layer. (Column 5 lines 24-33)

Regarding claim 35, Carcia et al. teach that the mask blank can have an anti-reflective layer. (Column 6 lines 1-20)

Regarding claim 36, Carcia et al. teach a photo mask utilizable in photolithography. (Example; Column 3 lines 30-39)

Regarding claim 37, Carcia et al. teach an apparatus for making a binary photomask blank in a chamber capable of evacuation to 10^{-3} - 10^{-5} Torr. A target 2 is present along with a substrate 4. A deposition particle source 1 which provides ions which sputters the target for deposition on the substrate 4. An assist particle source 6 is present for treating the substrate. (See Fig. 1; Column 4 lines 13-49)

Regarding claim 38, Carcia et al. teach that both particle sources 1 and 6 use ion beams. (Column 4 lines 13-49)

Regarding claim 40, Carcia et al. teach that the deposition source and assist particle source are separably controllably be selecting the ion energies of the beams. (Column 4 lines 53-59)

Regarding claim 41, Carcia et al. teach that the two beams can be of different particles and different energies. (Column 4 lines 17-43, lines 54-59)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 10 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carcia et al. (U.S. Pat. 6,756,161) in view of Campbell et al. (U.S. Pat. 4,885,070).

Carcia et al. is discussed above and all is as applies above. (See Carcia et al. discussed above)

The difference between Carcia et al. and the present claims is that the use of an electromagnetic field to direct particles is not discussed.

Campbell et al. teach utilizing electromagnetic coils for restricting the plasma ions in the tubular zone of an ion gun and the target. (Column 5 lines 26-33; Column 8 lines 32-47)

The motivation for utilizing an electromagnetic coil in an ion beam sputtering apparatus is that it allows for restricting the plasma ions in the tubular zone of the ion gun and the target. (Column 5 lines 26-33)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Carcia et al. by utilizing electromagnets as taught by Campbell et al. because it allows for restricting the plasma ions in the tubular zone of the ion gun and the target.

Claims 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carcia et al. (U.S. Pat. 6,756,161) in view of Scott et al. (U.S. Pat. 4,793,908).

Carcia et al. is discussed above and all is as applies above. (See Carcia et al. discussed above)

The differences between Carcia et al. and the present claims is that the substrate being condition by irradiating with the second particle beam is not discussed (claim 14), the surface of the substrate being cleaned of impurities by the second ion beam before deposition of the first layer (claim 15), providing at least one reactive gas during cleaning of the substrate is not discussed (Claim 16), and where the reactive gas comprises oxygen is not discussed (Claim 17).

Regarding claim 14, Scott et al. teach an IBAD apparatus in which the assist ion beam device conditions the surface of the substrate by smoothing before deposition of the layers. (Column 12 lines 13-16)

Regarding claim 15, Scott et al. teach an IBAD apparatus in which the assist ion beam device also cleans the surface of the substrate before depositing a layer. (Column 12 lines 13-16)

Regarding claim 16, Scott et al. teach that the assist ion beam can be formed of a mixture of argon, xenon and oxygen gases. (Column 12 lines 60-62)

Regarding claim 17, Scott et al. teach that oxygen can be utilized in the chamber. (Column 12 lines 60-62)

The motivation for conditioning and cleaning the surface of a substrate with an inert gas and a reactive gas such as oxygen is that it allows for cleaning and smoothing of the substrate. (Column 12 lines 13-16)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Carcia et al. by conditioning and cleaning the surface of a substrate with an inert gas and a reactive gas such as oxygen as taught by Scott et al. because it allows for cleaning and smoothing of the substrate.

Claims 21-23 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carcia et al. (U.S. Pat. 6,756,161) in view of Yakshin et al. (U.S. PGPub. 2004/0245090) or Mirkarimi et al. (U.S. PGPub. 2003/0164998).

Carcia et al. is discussed above and all is as applies above. (See Carcia discussed above)

The differences between Carcia et al. and the present claims is that flattening at least one of the surface layers by irradiating with the second particle beam after deposition of the at least one layer (Claim 21), depositing further layers on the substrate where the interface roughness between the layers is reduced by irradiating with the second particle beam (Claim 22), where the reflectance of the surface of a reflecting layer is reduced by irradiating with the second particle beam (Claim 23) and where the reflectance is altered by a xenon ion beam (Claim 26).

Regarding claim 21, Yakshin et al. teach that at least one layer of the multilayer system is deposited without ion beam assistance and is irradiated with ions after being deposited. (Page 2 paragraph 0026) Yakshin et al. teach that the process achieves a smoothing effect. (i.e. flattening). (Page 2 paragraph 0017) Mirkarimi et al. teach sequential deposition and etch steps. The deposition steps are carried out by ion beam sputtering and the etch steps are carried out by the secondary ion beam source. (Page 2 paragraph 0019) Mirkarimi et al. teach that the surfaces of the layers are planarized or "ion polished" (i.e. flattened). (Page 2 paragraph 0018)

Regarding claim 22, Yakshin et al. teach that after at least one layer has been deposited the layer is further irradiated with ions for some period of time before proceeding with the next layer. (Page 3 Claim 5) Here the Examiner interprets at least one to include more than one layer or multiple layers. Yakshin et al. teach that the layers are smoothed. (i.e. flattened) (Page 2 paragraph 0017) Mirkarimi teach that the layers of the multilayer structure are etched after depositing to produce planarized layers in the multilayer thus reducing roughness. (Page 2 paragraph 0018)

Regarding Claims 23 and 26, Yakshin et al. teach smoothing the layers for effecting the reflectivity of the layers. (See Abstract) Mirkarimi et al. teach that the reflectivity of the layer is decreased by utilizing their ion polishing process. (Page 3 paragraph 0026) Carcia et al. discussed above establish the use of a Xe ion beam. (See Carcia et al. discussed above)

The motivation for flattening at least one of the surface layers by irradiating with the second particle beam after deposition of the at least one layer, for depositing further layers on the substrate where the interface roughness between the layers is reduced by irradiating with the second particle beam, where the reflectance of the surface of a reflecting layer is reduced by irradiating with the second particle beam and utilizing a xenon ion beam to effect reflectance is that it allows for improving surface properties of the deposited multilayer (Yakshin et al. Page 1 paragraph 11) or improving thickness uniformity of the deposited layers. (Mirkarimi et al. Page 1 paragraph 0009)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Carcia et al. by flattening at least one of the surface layers by irradiating with the second particle beam after deposition of the at least one layer, by depositing further layers on the substrate where the interface roughness between the layers is reduced by irradiating with the second particle beam, reducing the reflectance of the surface of a reflecting layer by irradiating with the second particle beam and utilizing a xenon ion beam to effect the reflectivity as taught by Yakshin et al. or Mirkarimi et al. because it allows for improving surface properties of the deposited multilayer or improving thickness uniformity of the deposited layers.

Claims 30, 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carcia et al. (U.S. Pat. 6,756,161) in view of Angelopoulos et al. (U.S. Pat. 6,653,027).

Carcia et al. is discussed above and all is as applies above. (See Carcia et al. discussed above)

The differences between the present claims and Carcia et al. is that the grain size is not discussed (Claim 32) and the surface roughness of one of the layers is not discussed (Claim 33).

Regarding claim 32, since the grain size is a result effective variable and since Carcia et al. use process conditions the same as Applicant the grain size is believed to be the same. (See Carcia discussed above)

Regarding claim 33, Angelopoulos et al. teach forming a photomask blank utilizing sputtering techniques. (see Abstract; Column 3 lines 54-57) HIP sputtering targets are used to produce films having a RMS roughness of 0.20 nm. (Column 5 lines 5-7)

The motivation for producing films with a RMS roughness of less than 5 nm is that it allows for lower the defects in the film. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Carcia et al. by utilizing low grain size as taught by Carcia et al. and to produce low roughness films as taught by Angelopoulos et al. because it allows for lower defect films.

Double Patenting

A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.

Claims 1-23 and 27-43 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 1-38 of copending Application No. 10/367,539. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

Nonstatutory Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 24 and 25 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-25 of copending Application No. 10/367,539 in view of Carcia et al. (U.S. Pat. 6,756,161).

Claims 1-25 of Application No. 10/367,539 teach Applicant's method. (See Claims 1-25 of Application 10/367,539).

The difference between Application 10/367,539 and the present claims is that the first particle beam comprising an ion beam is not discussed (Claim 24) and the use of a Xe ion beam is not discussed (Claims 25).

Regarding claim 24, Carcia et al. teach utilizing a beam of ions from the deposition gun to sputter the target. (Column 4 lines 22-26)

Regarding claim 25, Carcia et al. teach utilizing Xe as the ion beam. (Column 4 lines 22-26)

The motivation for utilizing an ion beam of Xe for the sputtering is that it allows for producing masks with fewer defect particles. (Column 4 line 14)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Application No. 10/367,539 by utilizing an ion beam of Xe as taught by Carcia et al. because it allows for producing a mask with fewer defect particles.

Claim 26 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Application No. 10/367,539 in view of Carcia et al. (U.S. Pat. 6,756,161) as applies to claims 24 and 25

above, and further in view of Yakshin et al. (U.S. PGPub. 2004/0245090) or Mirkarimi et al. (U.S. PGPub. 2003/0164998).

The difference not yet discussed is increasing the surface reflectance.

Regarding Claim 26, Yakshin et al. teach smoothing the layers for effecting the reflectivity of the layers. (See Abstract) Mirkarimi et al. teach that the reflectivity of the layer is effected by utilizing their ion polishing process. (Page 3 paragraph 0026) Carcia et al. discussed above establish the use of a Xe ion beam for the assist beam. (See Carcia et al. discussed above)

The motivation for utilizing a Xe ion beam to effect reflectance of the layers is that it allows for improving surface properties of the deposited multilayer (Yakshin et al. Page 1 paragraph 11) or improving thickness uniformity of the deposited layers. (Mirkarimi et al. Page 1 paragraph 0009)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a Xe ion beam to effect the reflectance of the layers as taught by Yakshin et al. or Mirkarimi et al. because it allows for improving the surface properties of the deposited multilayer or improving the thickness uniformity of the deposited layers.


These are provisional obviousness-type double patenting rejections.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
June 9, 2005